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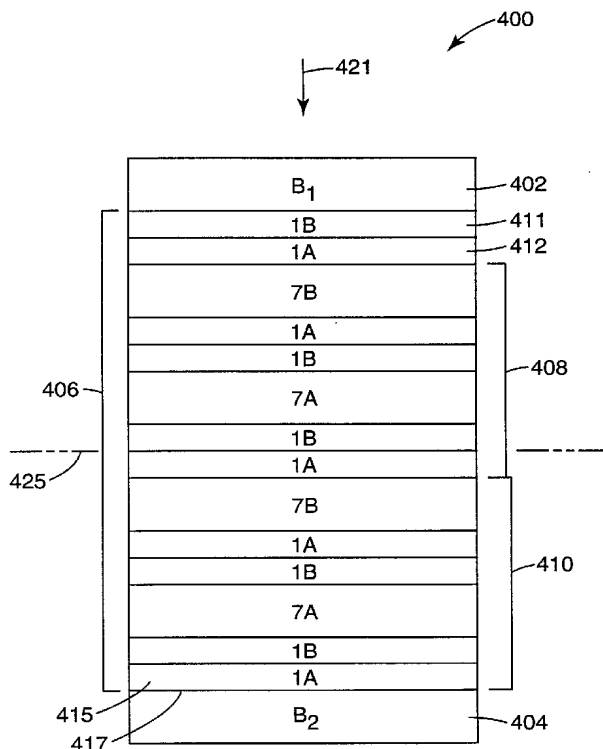
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[Continued on next page]

(54) Title: MULTILAYER INFRARED REFLECTING FILM WITH HIGH AND SMOOTH TRANSMISSION IN VISIBLE WAVELENGTH REGION AND LAMINATE ARTICLES MADE THEREFROM



(57) Abstract: A film includes a multilayer stack composed of unit cells having alternating optical layers of first and second diverse polymers A,B. The unit cells can consist essentially of two (AB), four (2A1B2C1B), or six layers (7A1B1A7B1A1B). The layers form an effective optical packet disposed between non-optical layers, the beginning and ending optical layers of which are selected to control an optical figure of merit such as spectral noise in the visible region. The arrangement of layers beginning at one end of the effective optical packet defines a specific cyclic permutation of the unit cell layer order, which provides a better figure of merit than an effective optical packet of similar design but having a different cyclic permutation.

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INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
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According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G02B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the International search (name of data base and, where practical, search terms used)

EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 049 419 A (WHEATLEY JOHN A ET AL) 11 April 2000 (2000-04-11) cited in the application column 6, line 8 - line 21 column 6, line 51 - line 63 column 23, line 33 - line 65	1-42
Y	figure 7	43-47
Y	US 4 854 670 A (MELLOR CHARLES E) 8 August 1989 (1989-08-08) figure 5 column 4, line 37 - line 58	43-47
A	US 4 793 669 A (PERILLOUX BRUCE E) 27 December 1988 (1988-12-27) column 6, line 54 - line 59	18
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☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No

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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>EISENHAMMER T ET AL: "OPTIMIZATION OF INTERFERENCE FILTERS WITH GENETIC ALGORITHMS APPLIED TO SILVER-BASED HEAT MIRRORS"</p> <p>APPLIED OPTICS, OPTICAL SOCIETY OF AMERICA, WASHINGTON, US, vol. 32, no. 31, 1 November 1993 (1993-11-01), pages 6310-6315, XP000403649</p> <p>ISSN: 0003-6935</p> <p>chapter "4. Coding of the Optimization Problem"</p> <p style="text-align: center;">-----</p>	18

INTERNATIONAL SEARCH REPORT

Information on patent family members

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Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6049419	A	11-04-2000	CN 1285922 T	28-02-2001
			EP 1055140 A1	29-11-2000
			JP 2002509279 T	26-03-2002
			WO 9936808 A1	22-07-1999
US 4854670	A	08-08-1989	US 4931315 A	05-06-1990
US 4793669	A	27-12-1988	US RE33729 E	29-10-1991